IN THE CLAIMS

Applicants are amending the claims so that, after amendment, they will appear as set forth in the clean version of the claims which appears below. For the convenience of the Examiner, all of the pending claims are set forth below, whether amended or not. Enclosed with this amendment is a marked-up version of Claims 4, 17 and 18, showing in bold type the changes which have been made by this amendment.

Please cancel Claim 19 without prejudice.

1. An apparatus, comprising:

a thermally conductive part having a fluid passageway formed therein; and

turbulence inducing structure disposed along said passageway in a manner selected to achieve a predetermined temperature profile along said passageway in material of said part adjacent to said fluid passageway, in response to fluid flow through said fluid passageway.

2. An apparatus according to Claim 1, wherein said structure includes protrusions extending from a surface of said fluid passageway toward a longitudinal, central axis of said fluid passageway.

3. An apparatus according to Claim 1, wherein said structure includes first and second protrusions extending inwardly from a surface of said passageway, said first protrusion being generally opposite said second protrusion

along a perimeter of said passageway in a plane approximately perpendicular to a longitudinal axis of said passageway.

4. (Amended) An apparatus according to Claim 1, wherein said structure includes an inwardly projecting annular protrusion formed along a perimeter of said passageway in a plane approximately perpendicular to a longitudinal axis of said passageway.

5. An apparatus according to Claim 1, wherein said structure includes a plurality of portions which each induce turbulence, wherein said portions are longitudinally spaced along said passageway from adjacent said portions, and longitudinal distances between adjacent said portions vary along said passageway.

6. An apparatus according to Claim 1, wherein said structure includes a plurality of portions which each induce turbulence, wherein said fluid passageway includes a first section and a second section, and wherein first distances between adjacent said portions along said first section are greater than second distances between adjacent said portions along said second section.

7. An apparatus according to Claim 1, wherein said part includes a cold plate.

8. An apparatus according to Claim 7, wherein said cold plate includes aluminum silicon carbide (AlSiC).

9. An apparatus according to Claim 7, wherein said part includes tubing at least partially embedded within said cold

plate, said tubing having a generally oval cross section, and wherein said passageway extends through said tubing.

10. An apparatus according to Claim 9, wherein said tubing includes stainless steel.

11. An apparatus according to Claim 9, wherein said structure includes crimps formed upon said tubing, said crimps extending toward a longitudinal, central axis of said passageway.

12. An apparatus according to Claim 9, wherein said structure includes dimples formed upon said tubing, said dimples extending toward a longitudinal axis of said passageway.

13. An apparatus according to Claim 9, further comprising a fluid supply device in fluid communication with said passageway for causing a thermally conductive fluid to flow through said passageway.

14. An apparatus according to Claim 13, further comprising a plurality of electronic components thermally coupled with said part, said components generating heat which is transferred to said fluid through said part.

15. An apparatus according to Claim 14, further comprising a phased array antenna system which includes said part, said structure, and said electronic components.

16. An apparatus according to Claim 14, wherein said temperature profile is approximately isothermal.

17. (Amended) An apparatus, comprising:

a thermally conductive flat plate having a fluid passageway formed therein; and

a plurality of turbulence inducing structures disposed along said fluid passageway, wherein locations of said structures are selected to achieve a predetermined temperature profile along said passageway in material of said plate adjacent to said fluid passageway, in response to fluid flow through said fluid passageway.

18. (Amended) An apparatus according to Claim 17, wherein said structures are longitudinally spaced from each other along said passageway, and longitudinal distances between adjacent said structures vary along said passageway.

20. An apparatus according to Claim 17, wherein said structures each include an annular inward protrusion.

21. An apparatus according to Claim 17, further comprising a plurality of electronic devices coupled with a first face of said plate.

22. A method of maintaining a predetermined temperature profile along material of a thermally conductive part adjacent a fluid passageway formed within said part, comprising:

providing turbulence inducing structure within said fluid passageway; and

selecting a configuration of said structure to achieve a predetermined temperature profile along said passageway in material of said part adjacent to said fluid passageway, in response to fluid flow through said fluid passageway.

23. A method according to Claim 22, further comprising:

configuring said structure to include a plurality of portions which each induce turbulence;

spacing said portions longitudinally from adjacent said portions along said passageway; and

selecting locations of said portions such that longitudinal distances between adjacent said portions vary along said passageway.

24. A method according to Claim 22, further comprising configuring said structure to include a plurality of portions which each induce turbulence and selecting locations of said portions such that first longitudinal distances between adjacent said portions along a first section of said passageway are greater than second longitudinal distances between adjacent said portions along a second section of said passageway.